

*** PROPOSED AMENDMENT ***
*** SUBMITTED FOR DISCUSSION PORPOSES ONLY ***
REMARKS/ARGUMENTS

I. Introduction

This proposed amendment is in reply to the Office Action dated September 7, 2005. The deadline for responding will be extended to March 7, 2005 by way of a request for a 3 month extension of time.

Claim 29 has been amended to change the claim dependency and claim 41 has been amended to clarify the wording of the claim. Claims 60-62 have been added to include "means plus function" apparatus claims directed to an apparatus which performs the method recited in original claims 27-30. Such an apparatus is shown in 3A of the present application.

Claims 1-6, 8-13, 15-20, 22-39, 41, 42, 44, 51-55, 57 and 60-62 will be pending upon entry of the amendment. Each of the previously pending claims has been rejected in view of various references which will be discussed below. As will be discussed, none of the applied references whether considered alone or in combination anticipate or render obvious the claimed subject matter.

II. The Pending Claims are Patentable

1. The 35 U.S.C. §102 Rejections

A. The Rejection of Claims 27-39 under
35 U.S.C §102 Should Be Withdrawn
Since the Jones patent does not
Show A Cyclic Prefix
with a "Continuity Portion"

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In the office action the Examiner rejected claims 27-39 under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,876,675 to Jones et al.

Notably the word "continuity" does not appear anywhere in the Jones patent. Independent Claim 27, as well as the other claims rejected based on the Jones patent, are clearly patentable because the Jones patent *does not discuss or disclose "a continuity prefix portion" or generating a multi-part prefix including such a continuity prefix portion, as recited in claim 27.*

By making the cyclic prefix L bits longer than needed due to the impulse response of the channel, the Jones patent can use the L bits in a receiver to support a tracking function which can be based on correlating the L bits of the supplemental portion to the L bits at the end of the symbol as part of a timing synchronization operation. (See the discussion of 6, 7 and 8 in the patent)

Claim 27 recites:

A periodic signal processing method, the method comprising:

generating a multi-part prefix from a first periodic signal, the step of generating a multi-part prefix from the first periodic signal including:

performing a cyclic extension operation on the first periodic signal to generate a cyclic prefix portion;

generating a continuity prefix portion; and

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appending the cyclic prefix
portion to the end of the
continuity prefix portion.

In rejecting claim 27, as being anticipated
by the Jones patent the Examiner states:

As per claim 27 Jones
discloses generating a multi-part
prefix from a first periodic signal,
the step of generating a multi-part
prefix from the first periodic signal
including performing a cyclic extension
operation on the first periodic signal
to generate a cyclic prefix portion
(figure 5 block 504 column 6 line 58 to
column 7 line 6); and **appending the
cyclic prefix portion to the end of the
continuity prefix portion** (figure 5
block 504 column 6 line 58 to column 7
line 6). (Office Action page 3)

As noted above, the Jones patent is devoid of any
mention of the word "continuity" and the Jones patent
does **NOT** discuss or disclose a "**continuity prefix
portion**".

The Jones patent describes a cyclic prefix which
includes, a first portion of length v in addition to a
second portion, e.g., of length L , to "facilitate
receiver synchronization". (See, col. 2, lines 30-34 and
also see the abstract which states "a supplemental cyclic
prefix is added to an OFDM signal to **facilitate
synchronization**") See Fig. 5 of Jones set forth below:

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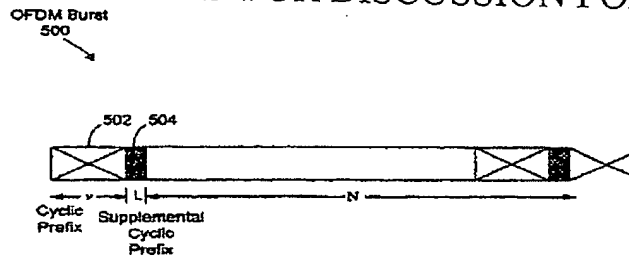


FIG. 5

The cyclic prefix 502 and the supplemental prefix 504 do not depend on the preceding symbol and are NOT for maintaining "continuity".

The supplemental cyclic prefix 504 is clearly described being used for synchronization NOT for maintaining continuity, e.g., from a preceding symbol. The cyclic prefix 502, which is of length v where v is greater than or equal to an impulse response of the channel, is also NOT for maintaining continuity. Instead, cyclic prefix 504, as described in the reference, is for addressing issues relating to the channel impulse response.

Accordingly, it should be appreciated that the reference does not disclose a prefix including the recited "continuity prefix portion" in addition to a "cyclic prefix portion".

In view of the above remarks, it is respectfully submitted that the rejection of claims 27-39 based on the Jones patent should be withdrawn.

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B. Additional Reason
Claims 27-39 Are Patentable

The rejection of claim 27 should be withdrawn for additional reasons as well.

Applicants note that in Jones, the "Supplemental Cyclic Prefix" 504 is appended to the cyclic prefix 502 while the claim requires:

"appending the cyclic prefix portion to the end of the continuity prefix portion".

Should the Examiner attempt to maintain the rejection it would require what appears to be an unreasonable interpretation that the "cyclic prefix 502" shown in Fig. 5 does not correspond to the "cyclic prefix portion" recited in the claim but rather "a continuity portion".

Accordingly, the rejection of claim 27 should be withdrawn for the additional reason that Jones shows the supplemental cyclic prefix being appended to the cyclic prefix and does not show appending a cyclic prefix portion to the end of a continuity prefix portion.

C. Additional Reason
Dependent Claim 29 is Patentable

The Jones patent fails to show generating either of blocks 502 or 504 from a preceding periodic

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signal. Accordingly, the rejection of dependent claim 29
should be withdrawn.

Dependent claim 29 recites in pertinent
part:

*processing a preceding periodic signal
to generate the continuity prefix
portion from the preceding periodic
signal*

In rejecting claim 29, the Examiner
states:

... Jones also discloses processing a
preceding periodic signal to generate
the continuity prefix portion from the
preceding periodic signal (column 2
lines 34-44 and figure 5 blocks 502 and
504 column 6 line 58 to column 7 line
6)

As discussed above, blocks 502 and 504 in the
cyclic prefix of the Jones patent are not used for
maintaining continuity and therefore there is no need or
reason to generate either of them from a preceding
periodic signal.

A review of Figure 5 and the portion of the
text cited by the Examiner reveals that the blocks 502
and 504 are generated from the last $v + L$ elements of a
symbol by "duplicating" them. See Fig. 5 and col. 2,
lines 26-33.

Since blocks 502 and 504 are generated by
merely duplicating the last portion of the symbol, it is
clear that these elements are not generated "from a

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preceding periodic signal" and that the rejection of these claims should be with drawn.

2. The 35 U.S.C.\$103 Rejections

A. The Rejection of Claims 1-4, 6, 8-10

The rejection of these claims is based on a combination of references which include the Jones patent discussed above at length.

As discussed above, block 504 in the Jones patent is NOT generated from a "periodic symbol representing the preceding symbol" as asserted by the Examiner in the rejection of these claims. (See Office Action page 8) Rather, blocks 502 and 504 are simply a duplicate of the end of the symbol as shown in Fig. 5 and discussed in the Jones patent at col. 2, lines 26-34. Accordingly the rejection of these claims which rely on the Jones patent as disclosing the above stated feature should be withdrawn.

B. The Rejection of Claims 41-45

Applicants respectfully submit that the references cite nothing close to what is claimed in independent claim 41 and that even if combined as suggested by the Examiner the references would not result in the claimed subject matter.

Independent Claim 41 recites in pertinent part:

A method of sequentially transmitting symbols in a multi-tone signal communication

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system using N tones per symbol period, wherein the N tones remain the same for multiple symbol periods, the time period in which the N tones remain the same being a dwell, the method comprising:

for each symbol transmission period of the dwell:

rotating a constellation of symbols from which consecutive symbols are transmitted using one of said N tones by a fixed amount which is a function of the duration of a multi-part prefix to be transmitted and the tone frequency used;

selecting a symbol to be transmitted from a constellation of symbols to be transmitted using a signal corresponding to one of said N tones; and

transmitting N signals corresponding to each one of the N tones of the multi-tone signal, each one of the N signals being transmitted on a corresponding one of a first plurality of antennas, the antenna being used to transmit signals corresponding to a particular tone during the dwell remaining the same throughout the dwell.

In the office action, in rejecting claim 41, the Examiner relies on a combination of references including the Cimini 1 patent, the Jones patent, and U.S. Patent No. 6,807,241.

The Examiner states:

Cimini1 doesn't disclose rotating a constellation of symbols from which consecutive symbols are transmitted using one of said N tones by a fixed amount and a function of the duration of a multi-part prefix to be transmitted with the selected symbol,

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wherein said fixed amount by which the constellation of symbols is rotated is a function of the tone frequency. Jones discloses rotating a constellation of symbols from which consecutive symbols are transmitted using one of said N tones by a fixed amount and a function of the tone frequency (figure 5 block 504 column 6 line 58 to column 7 line 6. It is very well known that a delay using a prefix in the time domain is equivalent to a rotation in the frequency domain see US 6807241 B1 Column 2, lines 4-17)

Applicants note that the claim is directed to a "A method of sequentially **transmitting** symbols". The Examiner's rejection seems to be based on some confusion between transmitter and receiver issues. The cited portion of Jones simply describes adding a cyclic prefix. This does NOT rotate the symbol being transmitted.

The Examiner cites U.S. Patent No. 6,870,241 which is directed to a receiver to argue that adding a cyclic prefix is the same as "rotating a constellation of symbols from which consecutive symbols are transmitted" as part of transmitting symbols.

Col. 2 of 6,870,241 cited by the Examiner states:

Generally, the partial frequency offset estimation is performed by estimating the phase rotation of the cyclic prefix portion of the OFDM frame in the time domain. Thereafter, the corresponding partial frequency offset is readily extracted from the estimated phase rotation.

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The frequency offset estimation being discussed happens in the receiver (see Cols. 6-7 which discuss Fig. 4) The phase rotation discussed in the applied reference is NOT the result of the transmitter rotating a symbol constellation prior to transmitting or using a cyclic prefix but rather a synchronization error resulting from the receiver not being fully synchronized with the transmitter. As the Examiner should appreciate, if the receiver is not perfectly synchronized with the transmitter, the receiver may recover varying amounts of the cyclic prefix which results in, what appears to the receiver, as a phase shift, e.g., phase rotation. However, this phase rotation is introduced by the synchronization error at the receiver and NOT by the fact that the cyclic prefix is used by the transmitter.

In view of the above remarks, it is respectfully submitted that the rejection of claims 41-45 should be withdrawn.

**C. The Rejection of Independent Claims
12 and 51 and Dependent Claims 13,
15, 16, 17, 52-55 and 57**

Independent Claim 12 is patentable because it recites:

A multi-tone signal communications method for communicating information using N tones, where N is a positive integer greater than one, the method comprising:

generating in parallel, for each one of the N tones, a separate

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periodic signal including at least one high order harmonic signal component that is different from the fundamental frequency signal component of said tone, **wherein the generated periodic signal includes a square wave; and transmitting the generated N periodic signals** into a communications channel.

Claim 12 is rejected under 35 USC §103 as being unpatentable over Ciminil in view of U.S. Patent No. 5,668,802 to Chalmers and further in view of U.S. Patent No. 5,903,857 Behrens.

In rejecting the claims, the Examiner notes that even after combining the Ciminil patent and the Chalmers patent the combination of these two references is not sufficient to disclose the subject matter of independent claim 12. The Examiner states:

Ciminil and Chalmers don't disclose that periodic signals is a square wave. **Behrens discloses the use of a square wave as a periodic signal (figure 8A column 11 line 30 to column 12 line 10)** Ciminil and Chalmers and Behrens teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the square periodic signal disclosed by Behrens in each of the multi-tone method disclosed by Ciminil and Chalmers. (Office Action Page 13)

Applicants respectfully submit that the Behrens et al. patent is directed to "A method and apparatus for calibrating an analog equalizer ... by injecting a known periodic signal into the analog filter and measuring a

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spectral value at a predetermined frequency." (See Summary, col. 2, liens 55-60) The patent goes on in the portion cited by the Examiner to discuss the benefits of using a square wave as the periodic test signal used in the calibration process. (See, col. 11, lines 6-50) Applicants do not agree that this testing is "the same field as endeavor" as the other references.

Applicants do not dispute that people have used test signal generators to generate square waves. While the use of square waves to test various signal components may be known, it is respectfully submitted that this does NOT render obvious using square wave signal generators in parallel to generate communications signals in the manner claimed. It also does not suggest replacing the signal generation means in the "high speed wireless transmission system" described in the Cimini 1 patent with a plurality of square wave generators. Accordingly it is respectfully submitted that the rejection of claim 12 and dependent claims 13, 15, 16, 17 which depend form claim 12 should be withdrawn. The rejection of independent claim 51 and the claims which depend therefrom should be withdrawn for the same reasons that the rejection of claim 12 should be withdrawn.

With respect to the Examiner's described "motivation" to combine the references, Applicants fail to understand how introducing square wave signal generators which tend to produce harmonics, into the Cimini 1 patent for a plurality of tones, would be considered "beneficial" even if "even numbered harmonics are zero and odd numbered harmonics decrease in amplitude

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" If the Examiner persists in the rejection it is requested that the Examiner explain why such a characteristic of harmonics would improve the Cimini 1 wireless communications system and where the Cimini patent describes a worse condition than that which would be introduced by the Examiner's proposed modification. Does the Examiner contend that using square waves will reduce the harmonics and if so what support does the Examiner have for such a position?

**D. The Rejection of Independent Claim 18
Claims 19-26 Which Depend Therefrom**

Applicants respectfully submit that the rejection of claim 18 is based on a miss-interpretation of a portion of the Cimini2 patent, i.e., column 5 line 35 equation 1. The Examiner interprets this cite as discussing **passband** signals when, in fact, it is **discussing basesband signals**. Column 5, lines 50-55 of the Cimini2 patent make it clear that a baseband signal is being discussed. These lines state:

The oversampling guarantees a separation of $f_s/2$ between the **baseband signal** and the first image of the signal output from the D/A converter 47. The separation results in a significant relaxation of the specification for the image canceling lowpass filters following the D/A converter 47. (bold added)

Generation of Passband signals is very different from generation of baseband signals and, as will be explained below, there are very different implications for harmonics. Accordingly, the distinction between baseband and passband signals should not be disregarded and the rejection should be withdrawn.

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Independent claim 18 is patentable because it recites:

A multi-tone signal communications method for communicating information using at least N tones, where N is a positive integer greater than one, the method comprising:
separately generating, for each one of the N tones, a *passband periodic signal representing a symbol*, at least some of the N generated *passband periodic signals include a high order harmonic signal component in addition to a fundamental frequency signal component*, the high order harmonic signal component having a frequency which is higher than the frequency of the fundamental signal component; and
transmitting the N generated passband periodic signals.

In rejecting claim 18, as well as claims 19 and 20 which depend therefrom under 35 U.S.C. §103, the Examiner relies on an Examiner proposed combination of the Ciminil patent in view of the Cimini2 patent.

The Examiner states:

Ciminil doesn't specifically disclose that at least some of the N generated passband periodic signals include a high order harmonic signal component in addition to a fundamental frequency signal component, the high order harmonic signal component having a frequency which is higher than the frequency of the fundamental signal component. It is very well known and inhehenty [sic] to the use of the DFT and Cimini discloses that at least some of the N generated passband periodic signals include a high order harmonic signal component in addition to a fundamental frequency signal component, the high order harmonic signal

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component having a frequency which is higher than the frequency of the fundamental signal component (column 5 line 35 equation 1).

As discussed above, the cited portion of the Cimini2 patent used to reject the claim talks about a BASEBAND signal NOT a **passband** signal as recited in the claim.

Passband signals are normally at the carrier frequency while baseband signals are normally at the frequency of the information signal which is then normally modulated onto a carrier to create the passband signal.

Consider for example, a 5 MHz band used to communicate information. A baseband signal may exist within this 5 MHz range. For example, a baseband signal may be used which has a frequency 1.25 MHz with additional information being communicated at other frequencies within the 5 MHz range. Assuming a harmonic at twice the 1.25 MHz signal frequency, the harmonic would fall at 2.5 MHz which would still be within the 5MHz range band used to communicate information.

Consider however the case of a passband signal with a fundamental frequency, e.g., a carrier frequency, of 1GHz + 1.25MHz with the bandwidth being used to communicate the information still being 5 MHz wide. Assuming a harmonic at twice this frequency, the harmonic would occur at 2GHz + 2.5MHz. Note that the harmonic is in the 2 GHz band well outside the frequency band of interest which is only 5 MHz wide in the example. From

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the example it should be appreciated that baseband harmonics are very different from passband harmonics and that the Examiner's references to baseband harmonics in no way anticipate or render obvious the claimed invention.

Applicants respectfully contest the Examiner's statements about what is well known. Applicants also contest the Examiner's statement regarding "inherency" made with respect to the use of a DFT somehow rendering the claimed subject matter obvious.

If the Examiner persists in the rejection or intends to make a new rejection it is respectfully requested that the Examiner cite a reference in support of the Examiner's position so that Applicants can have a full and fair opportunity to address the merits of the Examiner's position.

**E. Discussion of any
Remaining Claim Rejections**

i) Independent Claim 9 is Patentable

Independent claim 9 recites, among other things, "generating a first cyclic prefix part ..." and "generating a second prefix part ... the beginning of the generated second prefix part having the same phase as the end of the periodic signal representing the preceding symbol ...". This feature is not disclosed or suggest by the Jones patent as should be appreciated from the discussion of Jones patent set forth above with respect

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to claim 1. Accordingly, Applicants submit that the
rejection of claim 9 should be withdrawn.

ii) Independent Claim 51 is Patentable

Independent claim 51 recites, among other things, "N periodic signal generator circuits ... **each one of the N periodic signal generator including a square wave generator...**".

Accordingly, claim 51 and claims 52-55 and 57 which depend therefrom are patentable over the applied references for the same general reasons that claim 12 is patentable.

iii) New Claims 60-62 Are Patentable

New apparatus claims 60-62 are patentable for the same reasons method claims 27-30 are patentable.

III. Conclusion

In view of the foregoing amendments and remarks, Applicants respectfully submit that the pending claims are in condition for allowance. Accordingly, Applicants request that the Examiner pass this application to issue.

If there are any outstanding issues which need to be resolved to place the application in condition for allowance **the Examiner is invited to contact Applicants' undersigned representative by phone to discuss and hopefully resolve said issues.** To the extent necessary, a petition for extension of time under 37 C.F.R. 1.136 is hereby made and any required fee is authorized to be